

Appl. No. 10/766,831
Amtd. dated Aug. 22, 2005
Reply to Office action of May 20, 2005
Atty. Docket No. AP999US

Amendments to the Specification:

Please replace the paragraph beginning at page 1, line 27 with the following amended paragraph:

-- Many applications of lightguides require a very uniform irradiation distribution. This requirement is especially onerous where lightguides are used for imaging applications requiring a very uniform irradiation distribution across the field of view of the objectives. The present inventors have discovered that one reason why this ~~[[This]]~~ has been difficult to achieve in practice ~~[[due to]]~~ is the presence of virtual images that are produced by the guide. In the case of liquid lightguides, the images arise from light scattering that occurs due to non-uniformities, such as any imperfections at the sheath, the sealing member, or at the interface between the liquid and the sealing member. --

Please replace the paragraph beginning at page 3, line 15 with the following amended paragraph:

-- According to a first aspect of the invention, there is provided optical apparatus and a light delivery system for supplying said light to an input port of the apparatus such that the light illuminates a predetermined image plane within the apparatus,

said light delivery system comprising a lightguide for conveying said light from a light source unit to said input port, the lightguide having an inlet end for connection to an output port of the light source unit and an outlet end for coupling to the input port of the apparatus so as to provide substantially uniform light at said predetermined image plane,

there being imaging means at or adjacent the outlet end of the lightguide for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane. --

Please replace the paragraph beginning at page 3, line 25 with the following amended paragraph:

-- A light delivery system for supplying light to an input port of an optical apparatus such that the light illuminates a predetermined image plane within the apparatus,

said light delivery system comprising a light source unit for supplying said light, a lightguide for conveying said light from the light source unit to said input port; the lightguide having an inlet end connected to an output port of the light source unit and an outlet end coupled to the input port of the apparatus so as to provide substantially uniform light at said predetermined image plane,

there being imaging means at or adjacent the outlet end of the lightguide for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane. --

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Please replace the paragraph beginning at page 4, line 19 with the following amended paragraph:

-- An adapter unit for interfacing light from a lightguide of a light delivery system to an input port of the optical apparatus of claim 1 having a predetermined image plane within the apparatus such that the light illuminates ~~[[a]]~~ said predetermined image plane within the apparatus, the adaptor having an output port for connection to said optical apparatus and an input port for connection to the outlet end of the lightguide and comprising optical elements for providing substantially uniform light at said predetermined image plane, there being means at or adjacent the input port of the adaptor for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane. --

Please replace the paragraph beginning at page 4, line 6 with the following amended paragraph:

-- According to a third aspect of the invention, there is provided a lightguide for connecting a light source unit to an optical apparatus, so as to supply light to an input port of the apparatus that illuminates a predetermined image plane within the apparatus, the lightguide having an inlet end for connection to the output port of a light source unit and an outlet end for connection to the input port of the apparatus, there being imaging means at or adjacent the outlet end of the lightguide for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane. --

Please replace the paragraph beginning at page 2, line 20 with the following amended paragraph:

-- Fiberbundle lightguides made of some type of glass or quartz material also are used for imaging applications, and they also exhibit undesirable non-uniformities which scatter light and can be imaged onto the image conjugate plane of the imaging system. In the specific case of fused fiberbundles, for which the individual fibers at the distal end of the lightguide have been mechanically fused together, the non-uniformities can be due, for example, to the contact region between the end of the fused bundle and a quartz rod, or to irregularities or inhomogeneity in or at the fused region of the bundle. --

Please replace the paragraph beginning at page 11, line 3 with the following amended paragraph:

-- It will be appreciated that the positive and negative lenses have the same effect as displacing the interface 20 away from the outer end of the second sealing plug 18. It would be possible, therefore, to dispense with the positive or negative lens 24 and configure the sealing plug 18 so that its opposite end surfaces are very close together, at least as compared with those of known

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lightguides, so that both end surfaces are substantially at the image conjugate plane of the collector optics. Embodiments of the invention employing this approach will be described with reference to Figures 6 and 7. --